



PROGRESSIVE RESOURCE PROSPECTING CAMPAIGNS FOR LUNAR-DERIVED RESOURCES

Andrew (AJ) Gemer, CTO and Co-Founder

Space Resources Roundtable 2024

Lunar Outpost develops **advanced mobility, robotics, and systems** that enable a **sustainable presence on Earth and Beyond.**



CAMPAIGN APPROACH

Critical to advancing ISRU in a sustainable, responsive manner

- Current-generation instrument suites:
 - Forms
 - Distributions
 - Accessibility
- ISRU Materials
 - Feedstocks
 - Ores
 - Bulk materials
- Data informs
 - Priorities
 - Policies
 - Mission Architectures
- Apply lessons learned from prior missions
- Build towards next-generation capabilities



ADVANCED ROBOTICS ENABLING NEW FRONTIERS

Space



2. Infrastructure

- Robotic services to build and maintain infrastructure



3. Space Resources

- Access infinite resources of space to improve life on Earth



1. Robotics-as-a-Service

- Mobility
- Industrialized workforce

Earth



2. Infrastructure

- Robotic services to inspect, build, and maintain infrastructure



3. Resources

- Driving critical resource extraction towards a carbon neutral future

COMPLEMENTARY MARKETS, SAME TECHNOLOGY

OUR OUTPOSTS



Lunar Outpost US

Golden, Colorado

- Administration
- Canary Assembly
- Test Facilities



Lunar Outpost EU

Luxembourg City, Luxembourg

- EU Headquarters
- Deep Tech R&D
- Thermal Technologies



Arvada, Colorado

- Robotics
- Electronics
- Autonomy



Lunar Outpost Oceania (OC)

Melbourne, Australia

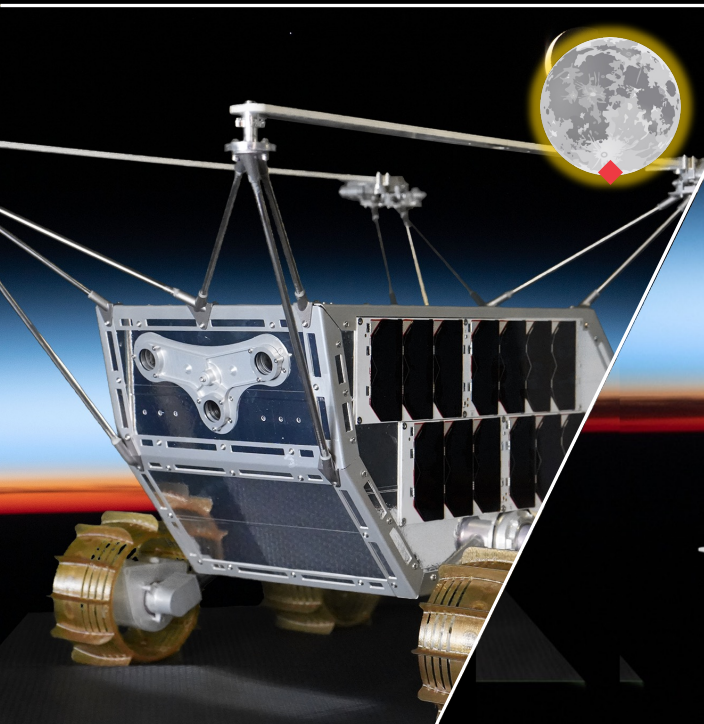
- AU Headquarters
- Carbon-Neutral Mobility
- Advanced, Clean Energy
- Autonomous Robotics



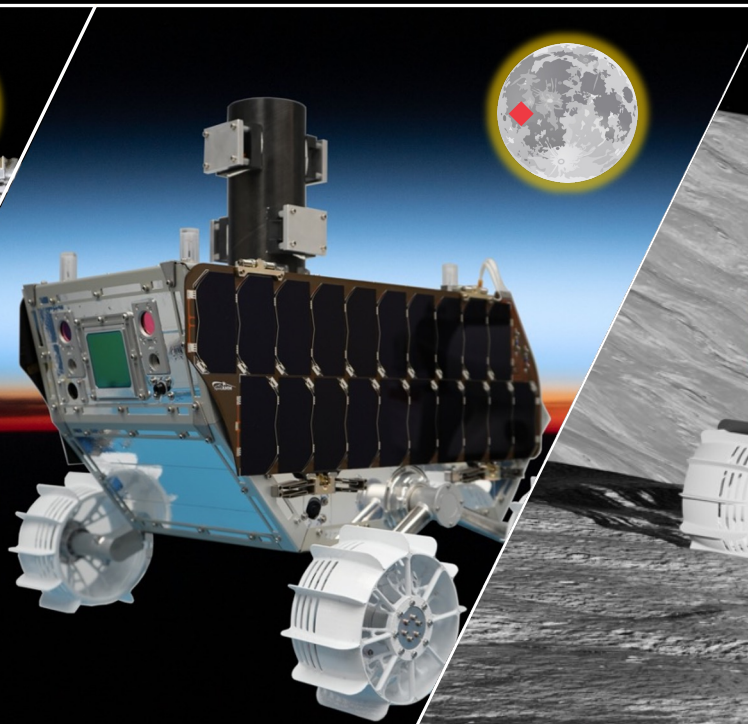
PROGRESSIVE SPACE RESOURCE CAMPAIGNS

Rapid technology maturation, risk reduction, broad science return, proven commercialization

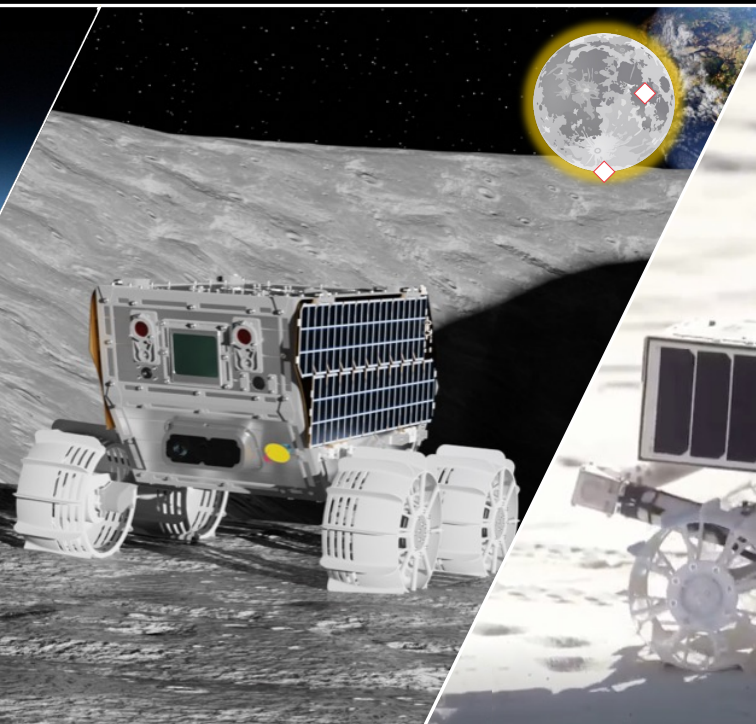
LV1: SHACKLETON RIDGE
LAUNCHING 2024



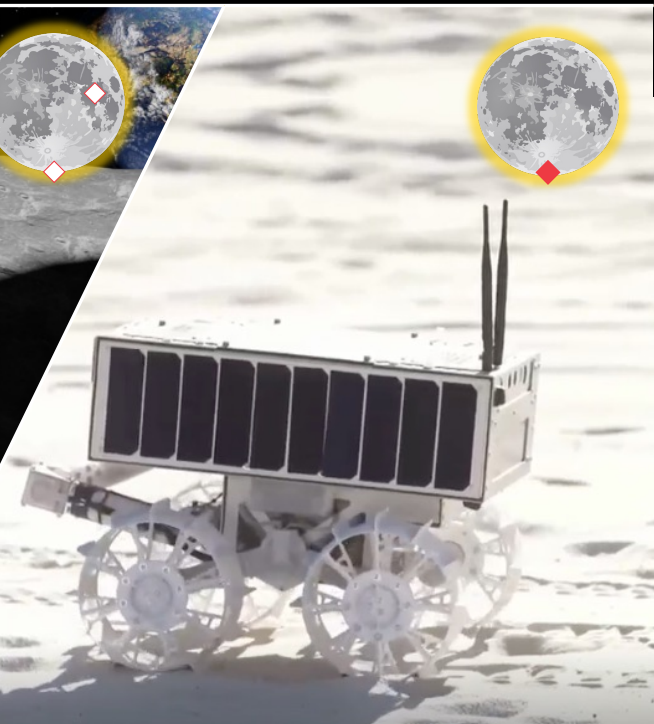
LV2: REINER GAMMA
LAUNCHING 2024



LV3: OPPORTUNITIES
LAUNCHING 2025



LV4: TRAILBLAZER
LAUNCHING 2026



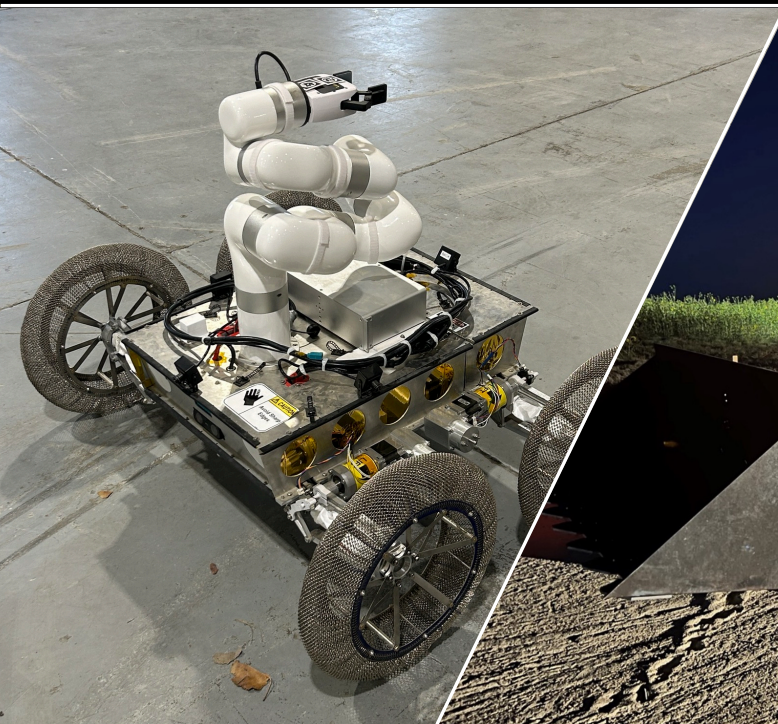


INCREASED CAPABILITIES, INCREASED ISRU

New Architectures, Instruments, Terrain Access, and Crew Safety

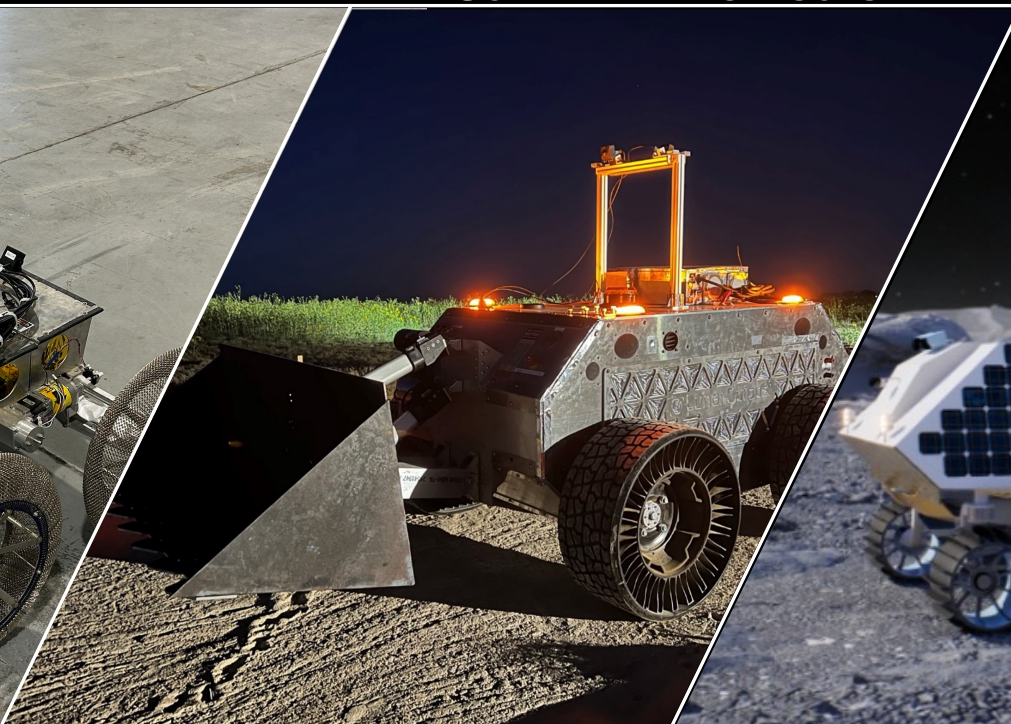
MAPP-ULTRA:

LONGER RANGE
FASTER TRAVERSES
DEXTEROUS MANIPULATION



HOUND:

BULK REGOLITH HANDLING
EXCAVATION & CONSTRUCTION
SCALED INFRASTRUCTURE



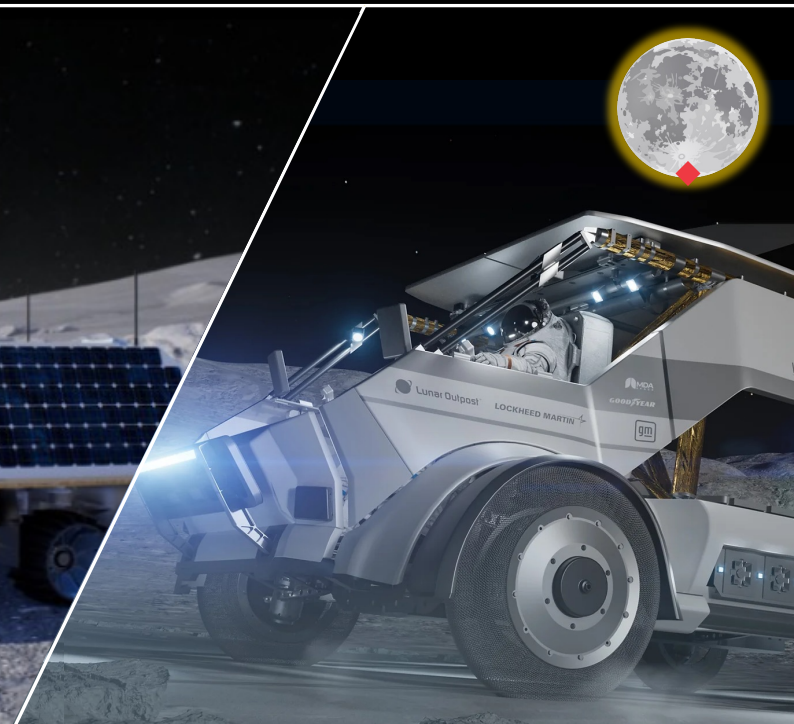
HIPPO:

MOBILE ISRU PROCESSING
DEEP SUBSURFACE
EXTRACTION

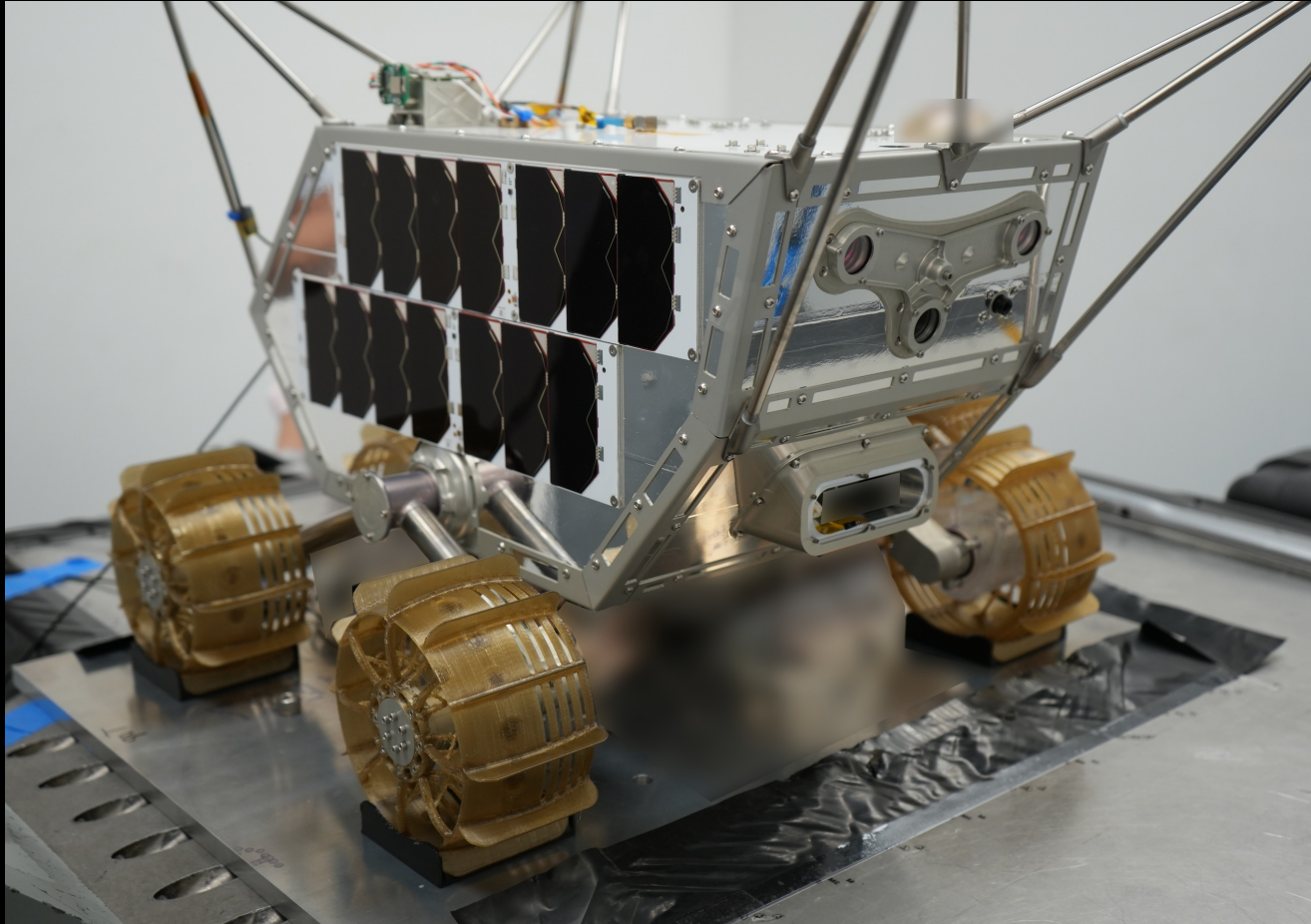


LTVS:

CREWED EXPLORATION
COMMERCIAL SERVICES
VAST OPPORTUNITIES



MAPP 3.0 LUNAR VOYAGE 1



Science & Prospecting Instruments:

- MIT RESOURCE Camera
- Stereoscopic 3D Context Cameras
- IR Thermal Camera
- Wheel-facing context camera

Key Partners
Launch: SpaceX

NOKIA

INTUITIVE
MACHINES

MIT

NASA SPACE RESOURCES CONTRACT

- 50-500g of regolith
- “As collected condition”, any location
- Provide imagery, location data
- In-place ownership transfer to NASA
- Results: 139.5g of JSC-1a, required 2m of driving to fill
- Policy advancement is as important as technology advancement



MAPP 3.0 LUNAR VOYAGE 2

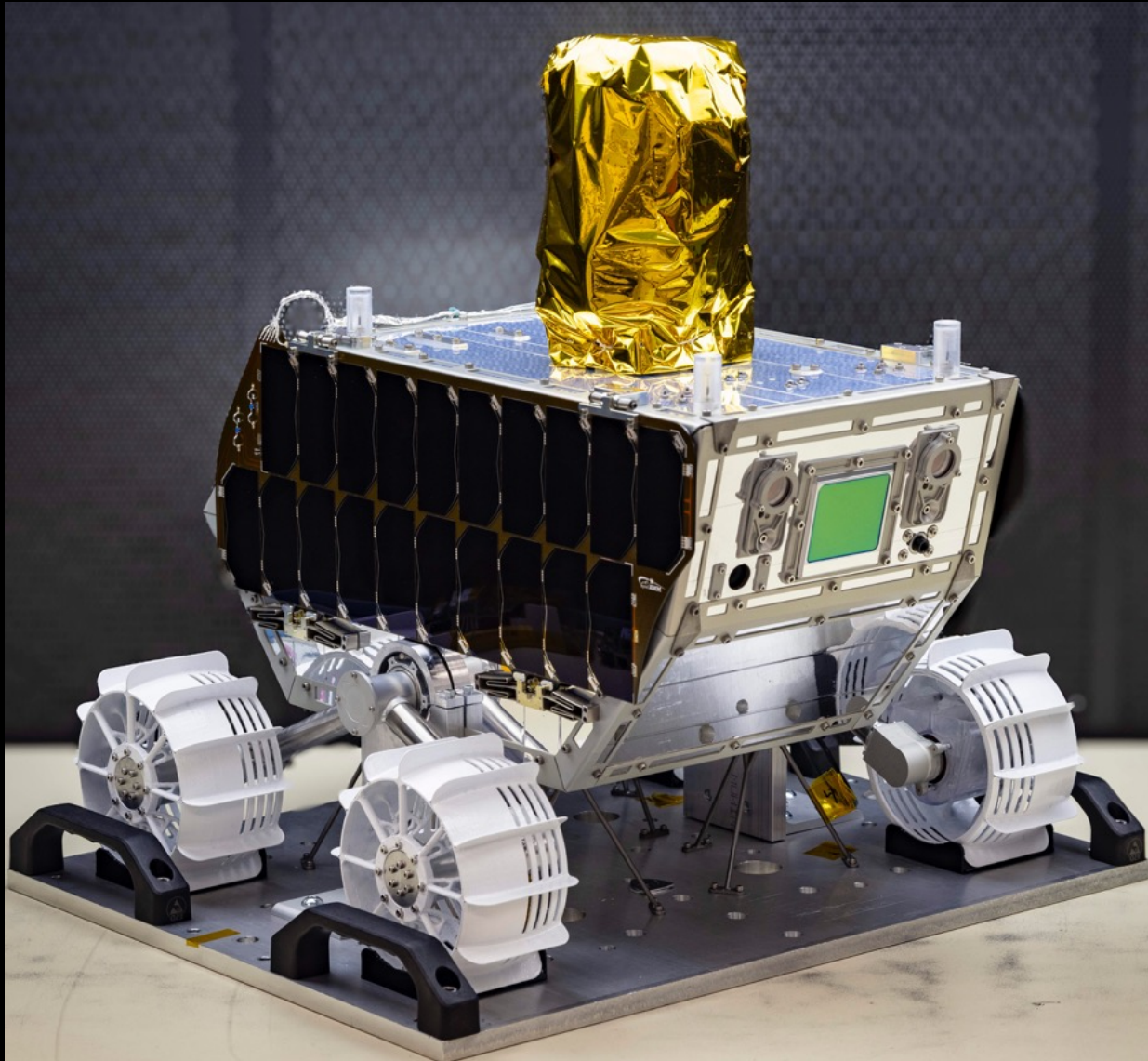


Image Credit: JHU APL

Science & Prospecting Instruments:

- Gen 2 Stereoscopic 3D Context Cameras
- Gen 2 IR Thermal Camera
- Lunar Outpost LIDAR
- JHU APL Vector-Magnetometer-Rover (VMR)
- JHU APL Rover Multispectral Microscope (RMM)

FULLY COMMERCIAL LUNAR VOYAGE 3 TO TRAVERSE THE MOON IN 2025

Key Partners



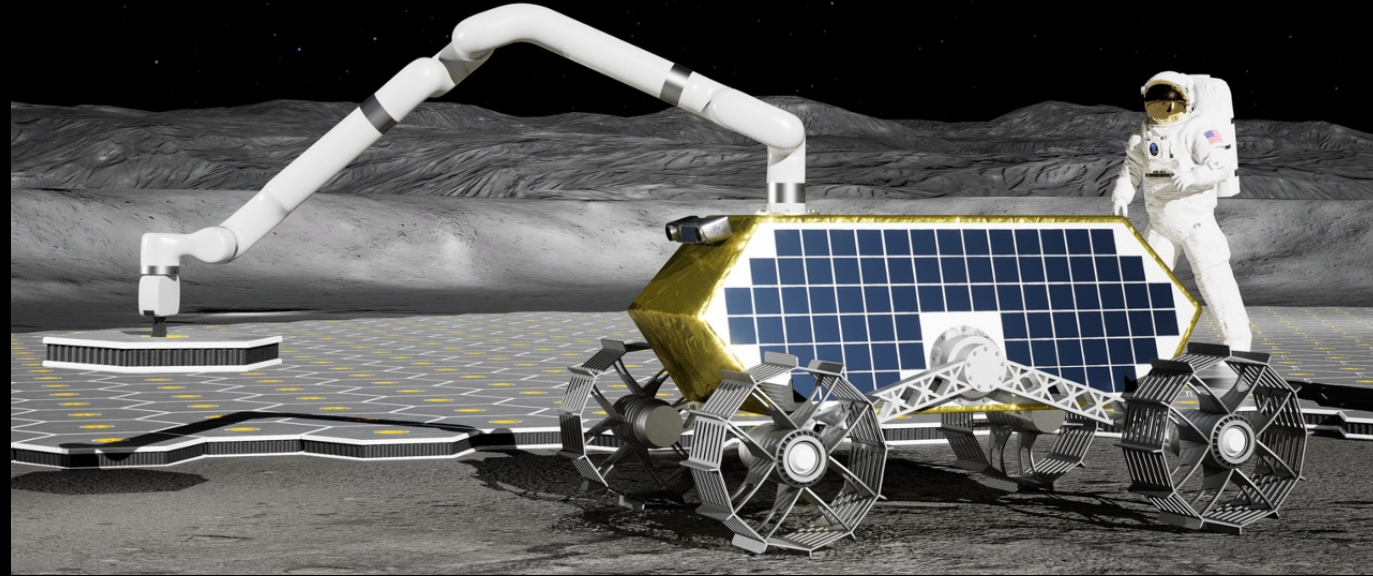
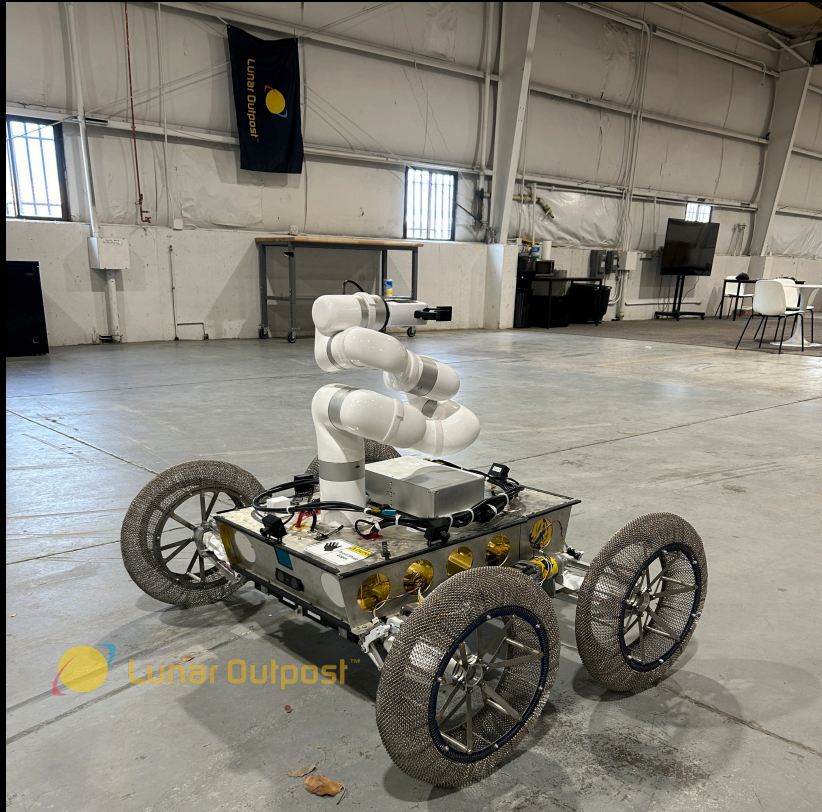
**PAYLOAD
OPPORTUNITIES
AVAILABLE**

AUSTRALIA'S MOON TO MARS **TRAILBLAZER PROGRAM**



INFRASTRUCTURE, CONSTRUCTION, AND MOBILE ISRU

- Robotic manipulation
- Solar arrays, landing pads, habitats
- Heavy equipment mobility



LUNAR TERRAIN VEHICLE SERVICES (LTVS)



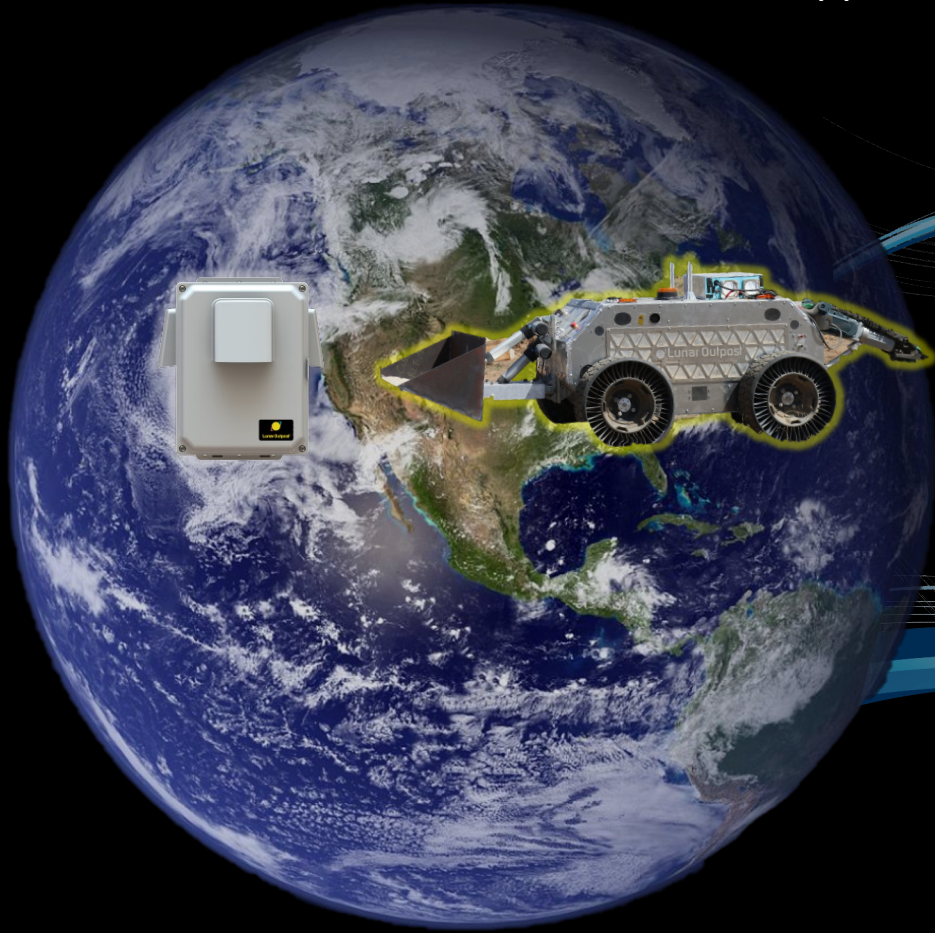
An industry-leading team for the design, development, operation, and commercialization of the **critical LTVS** program for NASA



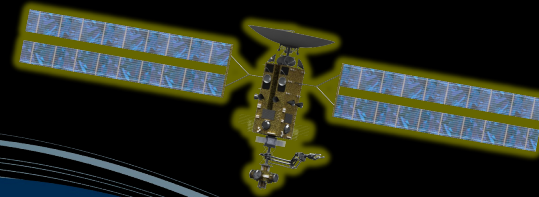


SUSTAINABILITY & TECHNOLOGY FLOWS

Already a **profitable** multiplanetary company, by **2024**, Lunar Outpost will be one of only a few companies operating on **3 planetary bodies**, validating commercial cislunar sustainability and supporting NASA's Moon to Mars Architecture



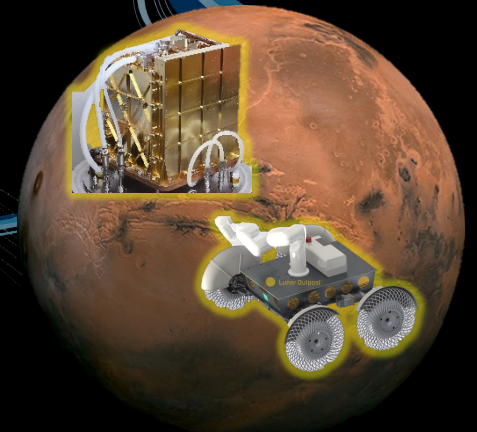
Deployed Thousands of
Products on Earth



Orbital & Cislunar Robotic
ISAM, Refueling, Logistics



Mobility,
Infrastructure,
Crewed Missions,
Commercial Ops
& NASA Lunar
Science



ISRU Oxygen on Mars
Sample Return

NASA's **BREAK THE ICE CHALLENGE** WITH COLORADO SCHOOL OF MINES

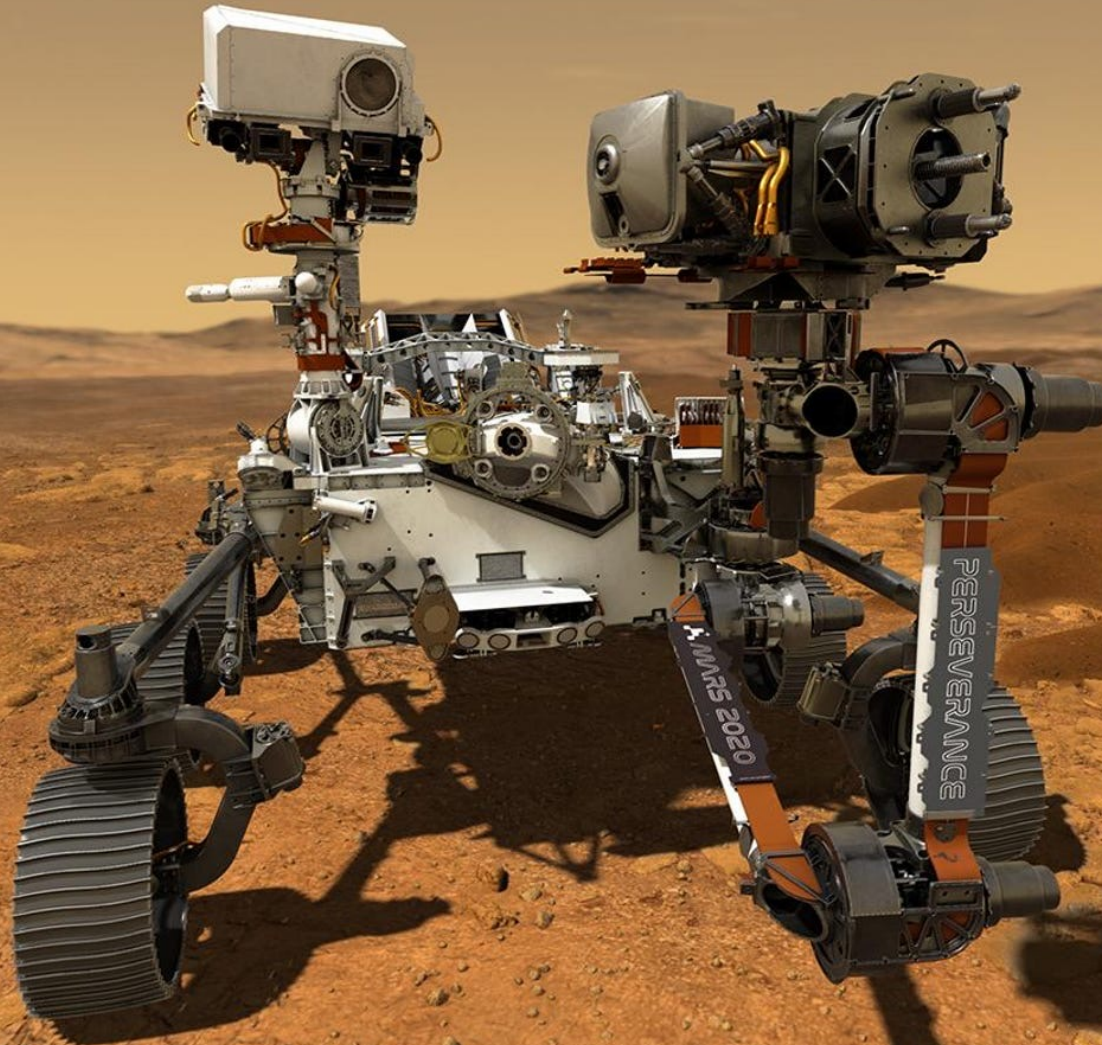
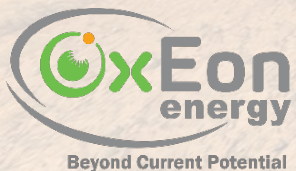


Delivered 12 metric tons of hardened icy regolith to a NASA processing facility

- **Ice Diggers named Finalist** in NASA Centennial Challenge
- 15 teams competing for \$1.5M in funding
- Continuous 15-day operation
- Excavate 800kg per day
- Deliver simulant 500m from site
- Commercial applications

LUNAR OUTPOST OPERATED **MOXIE** ON THE PERSEVERANCE ROVER ON MARS. MARS HERITAGE OVER 800 SOLS.

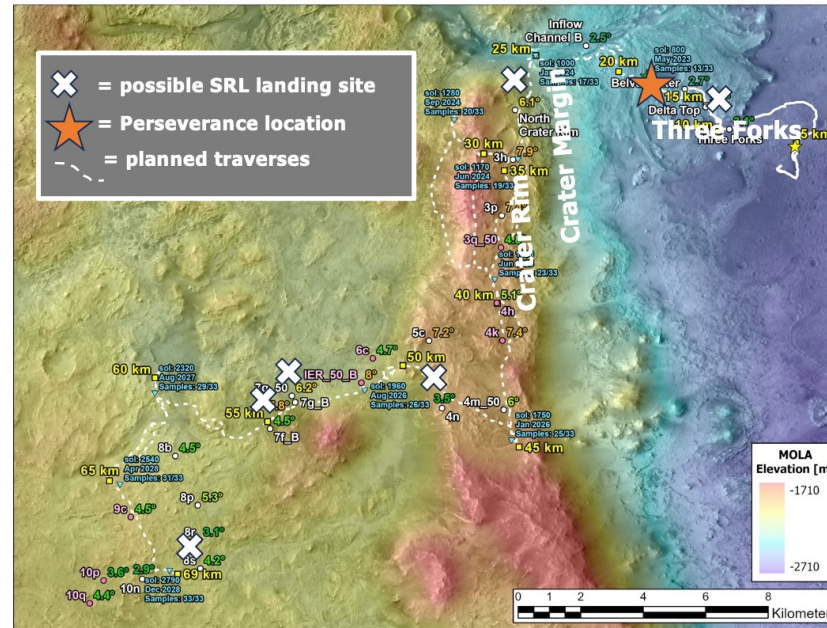
Key Partners



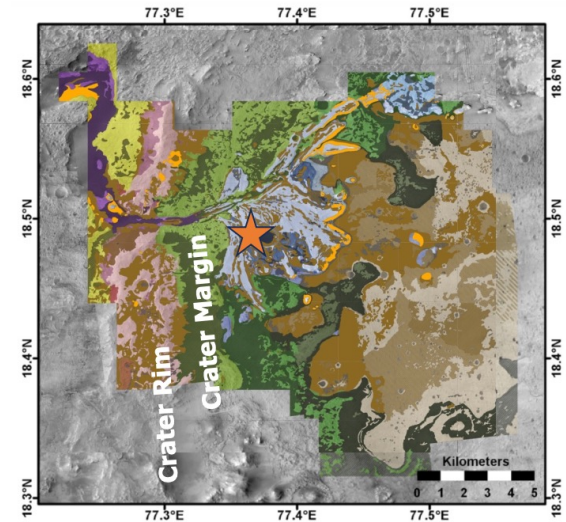
MARS SAMPLES AND PERSEVERANCE TRAVERSE

- Safe sample return is paramount
- Disruption of Perseverance traverse compromises science
- Commercial mission architectures are feasible and cost effective
- Robotic collection, delivery, and transfer of samples to MAV meets MSR needs

Diversity of Geologic Units on Crater Margin and Rim



Region of crater margin and rim, with possible landing sites (low slopes, few rocks) for SRL, identified from orbit for future certification by Perseverance.



Geologic map from orbit data for the Jezero Crater field site (Stack et al., [2020]). Each color indicates a distinct geologic unit.

THANK YOU

AJ Gemer, CTO & Co-Founder

Email: AJ@LunarOutpost.com

Phone: +1 (720) 825-0933



 **Lunar Outpost™**



LunarOutpost.com



LinkedIn/company/LunarOutpost/



Facebook.com/TheLunarOutpost/



[@LunarOutpostInc](https://Twitter/@LunarOutpostInc)